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INTEGRATING MARKETING AND MANUFACTURING IN A NEW OPTICAL
VENTURE

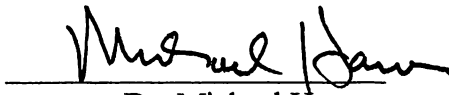
By
William Whitaker

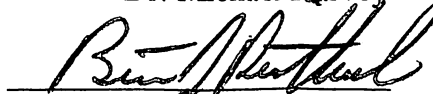
A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of
the requirements of the Sally McDonnell Barksdale Honors College.

Oxford
May 2005

Approved by

Advisor: Dr. Milorad Novicevic


Dr. Michael Harvey


Dr. Brian Reithel

This thesis is dedicated to my family, especially Dad, whose help was invaluable.

ACKNOWLEDGEMENTS

There are several very important contributors to this thesis that I would like to acknowledge.

First I would like to thank Dr. Novicevic of the School Business for helping me to develop the idea of the business as well as providing me with information and guidelines to complete it. He gave me many challenges that helped to produce a very thorough analysis and many ideas to help it succeed. His revisions and suggestions also ensured that the details within this work are accurate and precise. He is also a great professor, and many of the principles applied within this work were taken from his classroom instruction.

I would also like to thank Dr. Harvey for the many questions that started the creative process on this project. His push to prove the feasibility of this thesis was a major catalyst in brainstorming as much as possible and producing reasonable solutions to his constructive criticism.

Next I would like to thank Essilor USA for their contributions of information to this thesis, especially in the marketing department.

Also I would like to thank everyone at Tri City Optical for their instruction in the optical business for my benefit. Everything in the manufacturing section started with my knowledge from my work there, creating a strong foundation of personal experience.

Finally I would like to thank Dad and Mom who helped revise my thesis and took great interest in its completion and success.

ABSTRACT
INTEGRATING MARKETING AND MANUFACTURING IN NEW OPTICAL
VENTURE

(Under the direction of Dr. Milorad Novicevic)

The internet has allowed commerce to become more efficient and more profitable for companies involved in retail. The retail optical industry has failed to capitalize on this opportunity and this thesis explains how it can be done.

The opportunity to increase profits exists for optical labs in the form of inexpensive Mexican labor. By committing investment into a lab south of the Mexican-American border, business owners have a great deal to gain. This thesis explains how to operate manufacturing in Mexico and how to conduct operations more efficiently than American competitors.

By following some industry standards of marketing and evaluating new ways to approach product, price, promotion, and distribution, this thesis presents an efficient method for executing marketing operations.

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Overview

My intention in writing and presenting this thesis is to create a new business model for the optical business. By using the Internet to market products, I will create a fully interactive website to broadcast products globally and allow customers to experience the benefits of maximum interaction. The products of my proposed venture will include prescription lenses, frames, and sunglasses. More specifically, my proposed venture named Whitaker Optical will make and distribute single vision, bifocal, and progressive prescription lenses in plastic, polycarbonate, and glass and an optional anti-reflective coating. Whitaker Optical will also make and distribute traditional plastic, flexible wire, and designer frames. Its business model allows for each pair of glasses to be custom made. The speed at which its glasses are delivered to the consumer is critical to compete in the industry and is a major selling point for the company.

Manufacturing of the proposed venture will be outsourced over the Mexican-American border in order to take advantage of the tax incentives created by the North American Free Trade Agreement and the inexpensive labor cost of the Mexican labor force. However, as there are very few labs present in Mexico, and even fewer that are capable of handling the highly technological process of grinding and polishing lenses, meeting the requirements of a just-in-time (or JIT) inventory system, and maintaining the productivity level of American counterparts, all of these problems must be addressed. In particular, existing labs will need to be updated with new equipment, floor plans will need to be modified, assessments will have to be made determining whether new labs will need to be designed and constructed, and existing labs will need to be updated with new equipment and the floor plan be modified or it will be necessary for new labs to be

built. Employees must be trained, which means that managers with experience in a lab are essential, and command of the Spanish language is required.

A major challenge for Whitaker Optical is to develop e-commerce capability. To create a fully interactive website involves many hours of programming, presentation of available products, licensing of technology software, and synchronization of payment systems. Web design is a task that has grown tremendously in the past decade, and the demand for internet-savvy designers has grown exponentially. Building an e-commerce website from scratch can cost up to hundreds of thousands of dollars. Everything from creating a shopping cart feature, to making product pictures accessible to browsers, to synchronizing the receipt of an order with the manufacturing facility is integral to the success of the company. Included in this thesis is a shell of my proposed website "WhitakerOptical.com". While none of the features are truly functional, this program provides the shell, or basic web design, minus the final step of real world capability. It also includes a new way for the site customer to view himself in several styles of frames before he buys while seated at his personal computer.

Marketing is another challenge, especially for a start-up business such as this one. There are several ways to market glasses to consumers, which is the main goal of the company. Extensive advertising is needed in optometrists' offices as well as online, making it most efficient and effective in reaching the target market. There is definitely a market potential in the United States and abroad for glasses. As the population ages, the baby boomer generation may require their first or possibly second pair of eyewear. "Over the next 10 years, three types of service firms may benefit greatly from this anticipated

demographic change: medical, personal and household services.”¹ Interestingly WhitakerOptical.com fulfills the burgeoning need for prescription eyewear for the middle-aged, and acts as a business that meets their needs with little effort on their part. “The businesses of providing personal and household services will grow for the simple reason that as people age, they want more tasks done by someone else that they previously might have done themselves.”¹ WhitakerOptical provides the kind of in-home ordering and delivery that has made online companies such as Ebay an enormous success. However, obtaining products from manufacturers requires licensing rights and a purchasing agreement, resulting in the payment of royalties. Selling globally presents many problems that need to be addressed; for example: a company’s unwillingness to allow its products to be sold in certain markets because of brand positioning concerns of the company, thus making licensing without the name more appealing.²

¹ American Demographics, September, 2001

² Dana-Nicolet Lascu, International Marketing Managing Worldwide Operations in a Changing International Environment, Cincinnati: Atomic Dog Publishing, 2003, 169.

Manufacturing

The actual manufacturing of the lenses including the grinding and surfacing to the specific individual prescription will be performed in Mexico. The manufacturing of lenses is very labor-intensive; a lab that employs 23 workers can only produce around 550 pairs of lenses per day at maximum capacity. That means that one employee essentially manufactures approximately 24 pairs of lenses per day. Therefore, theoretically, in one hour an employee can manufacture three pairs of finished eyewear. At the average wage in an American lens lab of around eight dollars per hour, thus each pair of lenses requires \$2.66 in direct labor. Furthermore, the daily salary of all lab employees amounts to \$1,472 daily. This amount does not include any of the overhead involved in running a plant including the utilities bills, office workers, equipment upkeep, waste disposal, property rental, computer systems used to process orders, overtime and vacation pay, machine depreciation, factory utilities, factory supplies, and insurance³. The costs vary substantially depending on the square footage of the lab, the number of employees, number of duplicate machines, and the desired quantity of output, but the previous example is a fairly accurate guideline.

Perhaps the most expensive input is the direct materials involved, and there is very little that can be done to remedy this problem. Direct materials refer to the actual lenses that are bought and later processed into finished eyewear. There are two main types of lenses available for a lens lab to customize: semi finished and finished. A finished lens has already been ground and polished and has only edging and mounting left to be done. Therefore, they are more expensive to buy from the wholesale distributor

³ Warren, Accounting 19th ed. Cincinnati: South-Western College Publishing, 1999 p.672.

than buying semi-finished lenses. However, due to labor costs and time sensitivity for order processing, sometimes buying the finished lens is more cost effective. When operating from a lab in Mexico, the labor cost is greatly reduced, making semi-finished lenses the better choice of the two.

Lenses can be further classified by the four different materials from which they are made. Each lens manufactured today is one of, or a variation of, one of the following types: 1) plastic, 2) glass, 3) high index, and 4) polycarbonate lens. The first would be the plastic lens. "Plastic lenses are much lighter and less breakable than glass lenses. Traditional plastic lenses are made from a hard resin that is cast or molded in the wet state into lens blanks. These plastic blanks can be ground into specific shapes to fit any lens frame. The most common plastic lens material is called CR-39."

Additionally, lenses can be manufactured from glass. "Glass was the first material used to make eyeglass lenses. While glass can provide remarkably good vision correction, it's heavy and breakable."

The high index lens provides another option. "High index is an advanced material that provides significant advantages over traditional plastic or glass lenses. High-index lenses are: thinner, so you'll have slimmer glasses and can choose from a wider choice of frames; lighter, so your glasses weigh less and you'll feel more comfortable; flatter, so your lenses will bulge less from the frame, and if you are farsighted, your eyes will appear less magnified and more natural in size. High-index refers to the lens material's index of refraction, or the degree to which it refracts light. The higher index of refraction enables the material to bend light to a greater degree, so less curvature is needed in the

lens to achieve a specific prescription power. Because less material is required to produce the lens, lenses are lighter. High-index materials are available in hard resin plastic and extra impact-resistant polycarbonate plastic. There are also high-index glass materials". The anti-reflective coating is usually reserved for high index lenses.

The final lens type to consider is the polycarbonate lens. "For maximum impact resistance, polycarbonate is the lens material of choice. Polycarbonate lenses are ten times more impact resistant than conventional plastic or glass lenses. While impact resistant does not mean shatterproof, polycarbonate lenses can give an extra level of protection to lens wearers who have active lives or participate in sports. Polycarbonate is the material preferred for children and teenagers—as well as people who work in certain manufacturing occupations. In addition to its impact-resistant qualities, polycarbonate is thinner and lighter than conventional plastic or glass lenses—and it comes with built-in ultraviolet protection".⁴

Perhaps the most money-saving aspect of this business is the fact that direct labor and indirect labor involved in managing a lab can be greatly reduced by operating the lab in Mexico. "Average wages in Mexico's export-oriented maquiladoras sector are \$1.73/ hour, vs. \$2.17/ hour in the Mexican economy as a whole."⁵ Therefore, by plugging in for the same variables as above, the results imply that 23 workers in a Mexican maquiladora cost the lab approximately \$399 per day total. That means that at a daily output of 550 pair, each pair requires \$.73 of direct labor, less than a third of the direct labor cost in America.

⁴ http://www.sola.com/consumers/lens_materials.shtml

⁵ Karen Lissakers, Wall Street Journal, 11/19/92. <http://home.alltel.net/bsundquist1/gcib.html#TB3>.

A maquiladora is defined as “customs-privileged contract manufacturing facilities in Mexico that take advantage of low-cost labor.”⁶ These factories are a perfect opportunity for a small business such as Whitaker Optical to reap the rewards of tax benefits involved in outsourcing labor to other countries. “To encourage US companies to operate in Mexico, the US government subsidizes companies in Mexico that ship products to the US by removing import fees.”⁷ This means that any company that opens a manufacturing facility in Mexico is not only exempt from the property and business taxes involved in operating business in America, but it is also exempt from paying the tariffs involved in shipping products over the border. Therefore there is no incentive for any labor-intensive company to operate a manufacturing facility inside the United States border. The Mexican property and business taxes are far lower to encourage foreign investment ventures such as Whitaker Optical. It is essential to the survival and success of this international company to take advantage of the rewards of cross-border investment through NAFTA.

The numerical limit of 550 lenses daily takes into account that employees will work eight hours per day. When the business becomes profitable and recognized and job output exceed 550 pairs daily then further measures must be taken, such as hiring more employees to facilitate a night shift as well as investing in more machines for production. When the number of orders exceeds 1000 daily, then Whitaker Optical must look to expand by acquiring another lab facility and employing additional manufacturing employees as well as additional sales representatives within the United States. Eventually, the company will expand into international markets.

⁶ Lascu, International Marketing

⁷ <http://www.local2209.org/nafta/>

Many setups exist in lens labs today. The floor plans are often dictated by the amount of square footage available, the number of employees, the number of machines present, the capabilities of the lab, and the desired amount of production. I believe that the optimal starting lab for Whitaker Optical will house around 25 employees, be fully capable in Anti-Reflective (AR) Coating ability, and produce around 550 pairs of lenses daily. There must be at least four main sections contained within the entire facility including the offices, inventory warehouse, main grinding and surfacing lab, and special coating clean room. The entire square footage of such a lab would be approximately 10000 feet. The two following Figures represent a lab called Future Optics, which already exists, and my proposed lab labeled "Whitaker Optical".

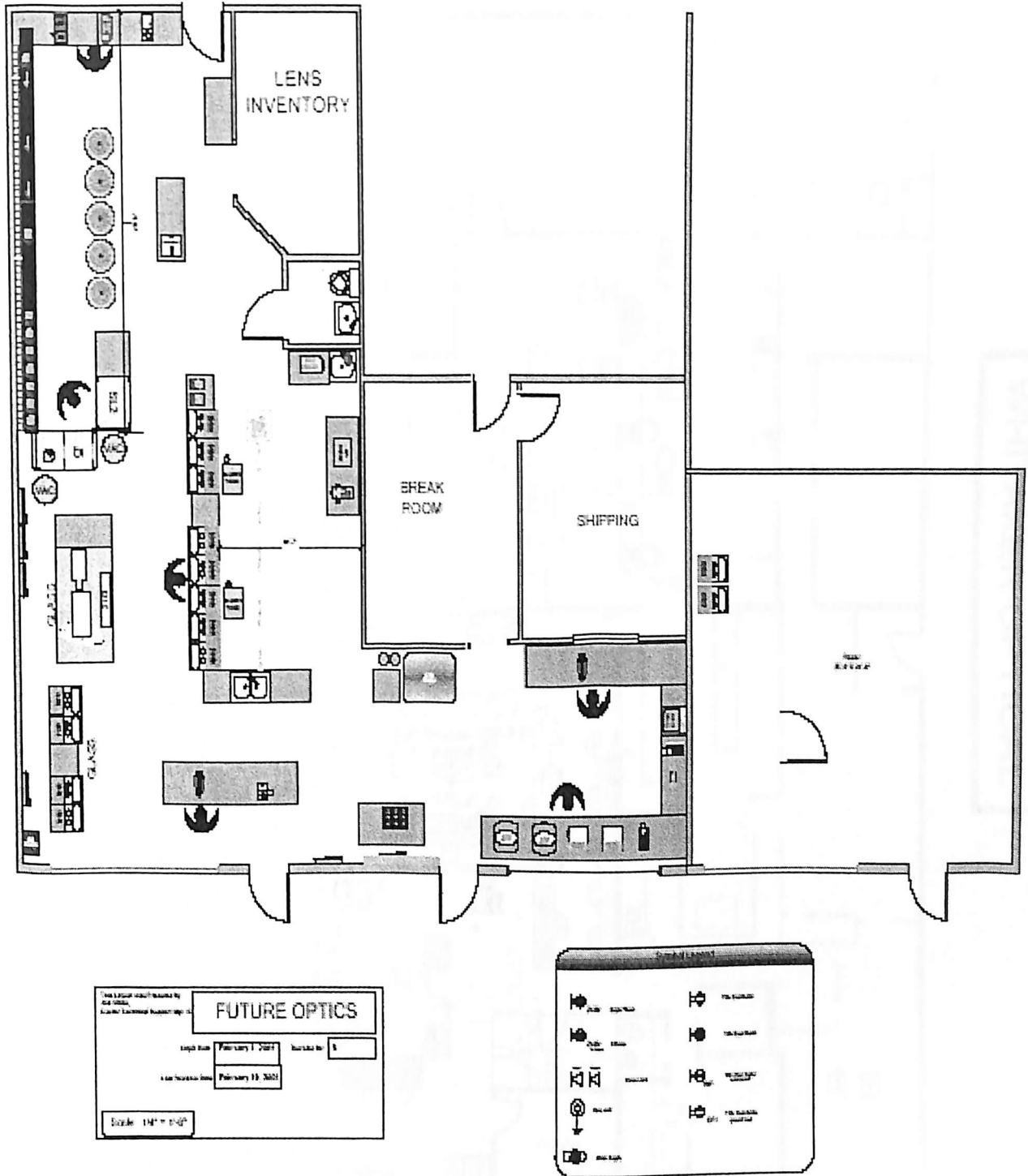
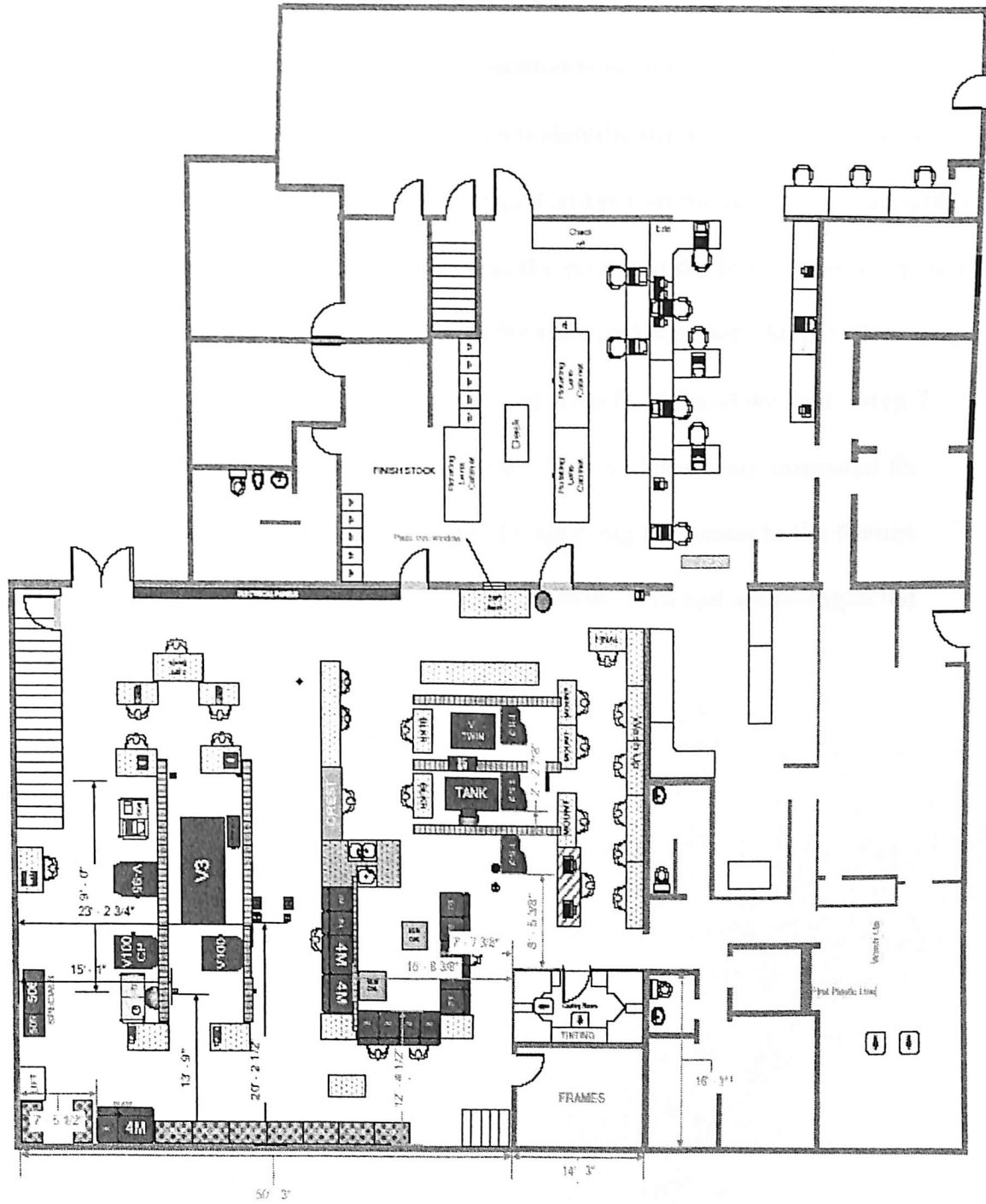


Figure 1.1 Future Optical Blueprint



WHITAKER OPTICAL

Figure 2.2 Whitaker Optical Blueprint

The flow of the lab is described in the following steps, which will be further explained later in this chapter. A visual representation is present in Figure 1.3. Step 1: Lenses are taken from inventory and assigned a job identification number as well as a specific set of instructions. Step 2: Lenses are taped and put on metal blocks compatible with the generator. Step 3: Generator grinds specific power of the lens. Step 4: A tool is applied to the lens making it compatible with the finer and polisher. Step 5: Lenses are fined and polished. Step 6: Lenses are removed from blocks and washed. Step 7: Lenses are edged to the shape of the desired frame. Step 8: Lenses are inspected for flaws or prism. Step 9: Eyewear is constructed by applying the lenses to the frames. Step 10: If necessary, glasses are given a coating in clean room and are re-inspected. Step 11: Lenses are shipped to address of customer.

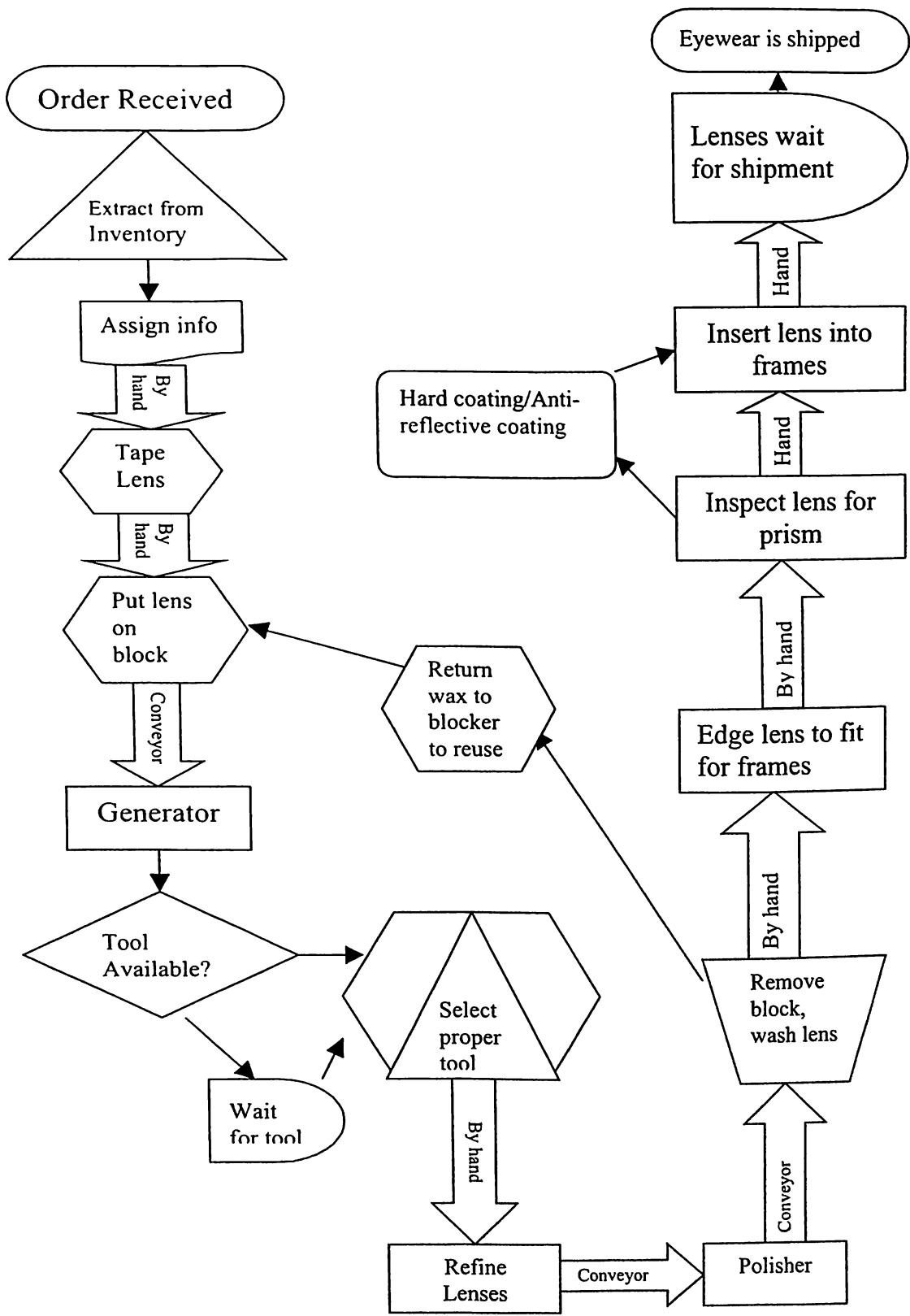


Figure 1.3 Lens Lab Work Flow

The setup of the lab is an important factor in the efficient production of lenses. The first step is the procurement of the blank lenses. When the lenses are purchased and shipped to the lab they must be stored in inventory. There are literally thousands of combinations of lenses to store on the shelves; therefore, space is at a premium. Most labs buy enough lenses to maintain production for two weeks to a month. Sales representatives from the major lens manufacturers visit the lab, fill out orders, resolve disputes, set a price, and deliver the goods according to the amount specified by the manager or owner of the lab. "The costs of maintaining inventory include those associated with storage (operating a warehouse, for example), spoilage and loss (some stored inventory gets ruined, damaged, or stolen), and opportunity costs (an investment in inventory cannot be put to other business uses)."⁸

These costs are especially relevant in the optical industry. Operating inventory requires at least two employees at a lab of about 25. That means that the inventory system must be efficient and not too extensive, reducing the requirement of additional labor time. Storing a pair of lenses in each category can cost thousands of dollars just from the cost of the individual lenses. Another cost is obsolescence. The large lens manufacturers introduce new products frequently, and that means that they are also pushing the new product both to end consumers through advertising and to optometrists supplying the consumers. If a product has been on the shelf long enough for this to occur, then it becomes a loss, and the inventory system has failed. The opportunity cost is also foregone in this case. The money spent on the older model lenses has been wasted where it could have been apportioned to buying the newer product.

⁸ Griffin, Pustay. International Business a Managerial Perspective 3rd Prentice Hall, 2003.

For these reasons I believe it is best that we use a Just -In- Time inventory system.

A JIT inventory system is defined as “systems that schedule materials to arrive exactly when they are needed in the production process.”⁹ Systems designed especially for the optical industry already exist, including CC Systems, a company that provides the software necessary to run a just in time inventory.¹⁰ Each type of lens will be assigned a code, which will be entered into a database. For example an unfinished, scratch coated, Essilor Varilux Panamic progressive lens with Transitions automatic shading could be labeled “00024”. After every instance in which a 00024 lens or pair of lenses is used, the computer will register its usage and automatically create a report of when it was used, for which patient, and what job number. It will also create a list of the lenses that need to be reordered, which the inventory employees will deliver to the lab manager as often as desired, up to several times daily. The lab manager will then communicate to the lens sales representatives via telephone, and the replacement lenses will be delivered on that day or the following day. I would discourage fully automating the reorder process because of the aforementioned obsolescence of certain lines, and I would advocate instead that the lab manager should communicate directly with the suppliers in order to increase accountability on the part of the manager.

Ideally, the first order for a specific lens will be processed and completed without any delay, and the identical replacement pair will be reordered almost simultaneously. However, if another order is placed for the exact same product within a short amount of time, before the pair can be restocked, there must be a remedy. The computer inventory system must recognize the urgency of response to the shortage, and notify the employees

⁹ <http://www.moneyglossary.com/?w=Just-in-time+inventory+systems>

¹⁰ http://www.opticalonline.com/labfeat_jit.shtml

that immediate action must be taken. The manager must then request from the supplier that a pair of the specific lenses be sent as soon as possible. Depending on the time the shortage occurs, the pair should be delivered to the lab overnight. Upon arrival the next day, the job must be expedited through the system and given priority over more recent orders so that the reputation of rapid delivery is reinforced.

Other issues that must be addressed in the inventory system are defective lenses and lab mistakes from machine and employee error. Defective lenses were improperly molded or created at the major lens manufacturer. They contain blurs or blemishes in the material that are detrimental to the clarity of the lens. When these lenses are surfaced in the lab, prism occurs. This prism is a distraction to the wearer's eye and is unacceptable. However, many of these blemishes are invisible to the human eye until the lens is surfaced and finished. It is then up to the inspectors in the lab and the manager to identify any prism within a finished pair. The major suppliers all provide complimentary replacements to the labs for defective lenses, but there is obviously a loss of time from the mistake. The inspector who identifies the mistake must inform the manager, who must add an additional pair to the lab's daily order as well as redeem the defective pair to receive the free replacement. Once again, upon receipt of the replacement the job must be expedited through the system by being given priority.

Lab mistakes from machine and employee error are another factor prevalent in any lab, especially a new one. A miscalculation by an employee in charge of grinding a lens to mere millimeters or less can destroy the shape and surface of a lens, rendering it completely useless. Unfailingly mistakes are made. The employee must make the manager aware of these mistakes, and he must adjust his inventory order accordingly.

Waste is very expensive for the lab in terms of cost of materials, labor, time, and also opportunity cost, and must be constantly avoided. The success of Whitaker Optical greatly depends on the delivery of an order in a very short period of time.

With each pair of lenses ordered, usually accompanying the order is a prescription information form. This form is the information concerning the individual's eye and it tells the lab how a lens can be made to compensate for problems within the eye. It is a combination of the specifications deemed necessary for correction by an optometrist, as well as certain features that the consumer would like as supplementary features of the eyewear such as anti-reflective coating and frame type. The following Figure 1.4 is an actual Prescription form used by Essilor labs.

"This form must be filled out completely"

Date Received: 5/13/05
Charge Department: _____
Patient's Name: _____

Management Approval: _____
Employee's Name: _____

SPHERE CYLINDER AXIS ADD PRISM

BASE

OD {R} +0.50 sph 1.50
OS {L} +0.50 -0.50 150 1.50

PD OD Dist: OD Near: OD Fitting Height:
 OS Dist: OS Near: OS Fitting Height:

LENS MATERIAL:

<input type="checkbox"/> CR39	<input type="checkbox"/> Transitions	<input type="checkbox"/> Ormex
<input type="checkbox"/> Thin&Lite	<input type="checkbox"/> Xtractive Transitions	<input type="checkbox"/> Ormex Trans III Grey
<input type="checkbox"/> Polarized	<input checked="" type="checkbox"/> Airwear (Poly)	<input type="checkbox"/> Ormex Trans III Brown
<input type="checkbox"/> Glass (Special Order)		<input type="checkbox"/> Other: T&L 1.67

LENS TYPE:
Single Vision

Bifocal

Trifocal

Progressive

Spherical
 Aspheric
 Essilor Thin

ST28 7 x 28
 ST35 8 x 35
 Round 22
 Diplomat (Full Seg)

Panamic
 Comfort
 Essilor Natural
 Varilux Plus
 Adaptar
 Interview

Other:

COATING TYPE:
 Scratch Resistant
 Backside Hard Coat
 Reflection Free
 Crizal

UV Coat
 Tint: (Color):

Safety Thickness: Yes
 No

FRAME INFORMATION
A Box
DBL
B
ED

FRAME STYLE
 Zyl
 Metal
 Rimless Groove
 Rimless Drill Mount
Name: Wrap
Manufacture:
Color:

FRAME ENCLOSED
 Yes
 No
 To Follow

Return To:
Name: _____ Location: _____ Phone: _____

Figure 1.4 Prescription Form/Lab Instructions

The next step in the manufacturing process after the lenses are brought from inventory is to place them in a job tray with specific instructions on how they are to be ground, polished, and edged. These instructions contain the numbers to be entered into the machines that precision grind and surface as well as shape the lens. There are also instructions for further coating of the lenses or other custom specifications. Each tray is assigned a number specific to that job as a way of identifying that job throughout the manufacturing process. That way if there is a change to the order, it can be quickly found and adjusted. It is also a way for the manager to monitor the rate at which the jobs are being produced. By accounting for each job with a number, the manager can view when the job was initiated, when it reached certain stages of production, and when it was completed and shipped. An example of these specialized instructions is given in Figure 1.5.

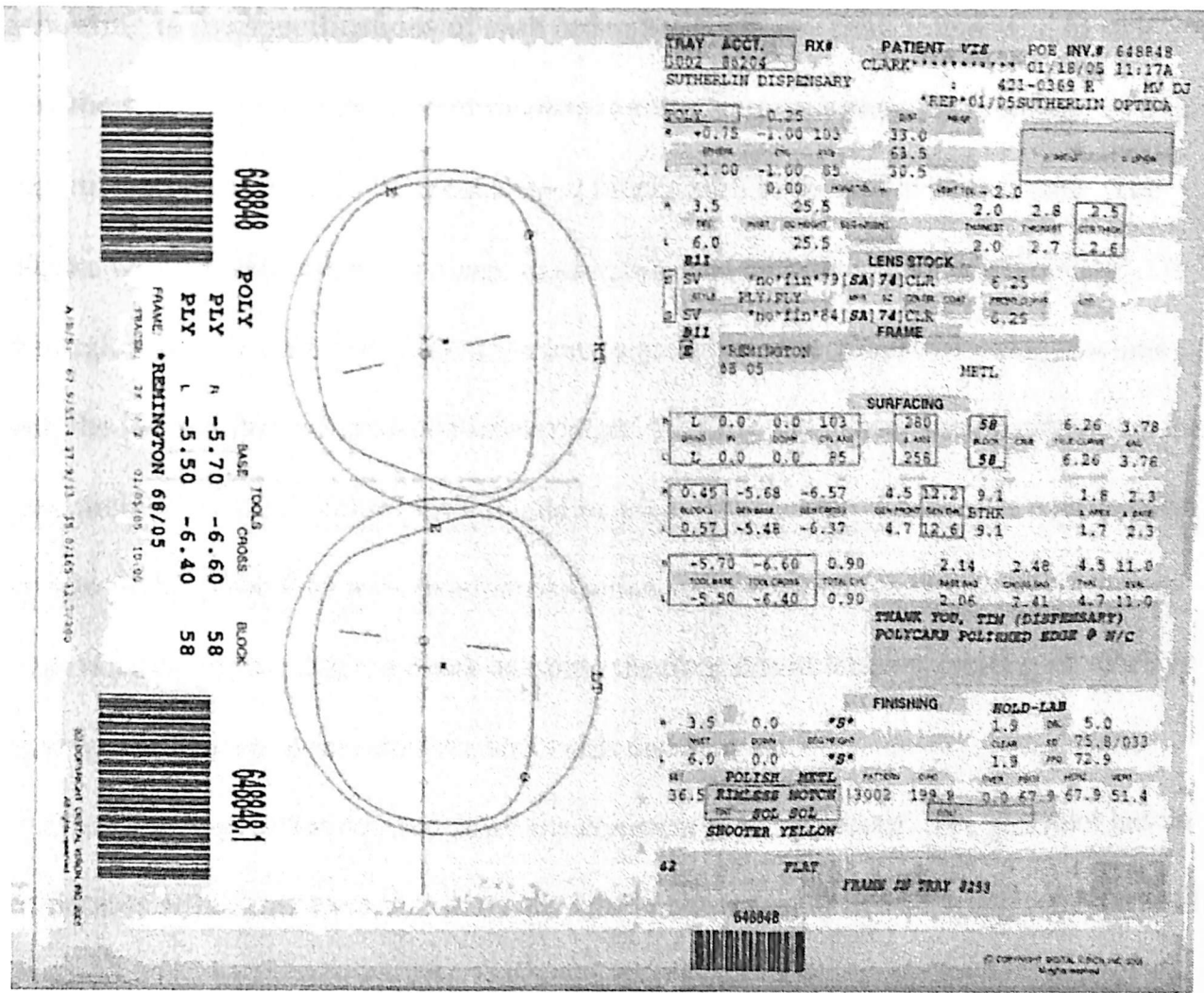


Figure 1.5 Lab Work Ticket

The lenses must be covered individually with protective tape on one side to ensure that the front side of the lens will not be scratched during the process. The tape machine is a pneumatic device that holds the lens in a certain position as protective tape creates an airtight chamber, and the lens is protected with a smooth surface. The lenses are kept together in their assigned trays and transferred to the next step in close proximity by hand.

Next comes the blocking phase. A metal block, essentially a steel disc slightly smaller than the lens, is applied to the protected front side of the lens so that the lens is compatible with the machines involved later in the manufacturing process. Each lens,

according to the specifications of each order, has a different front side power, meaning that the curve on the front side of the lens is either steeper or more flat. Because of this variation in front power, different shaped blocks must be applied to compensate. The blocks will be color coded by shape to save time and increase employee efficiency through faster recognition. When the lens is precisely placed on the blocking machine and the job number entered into its computer, the LED will display information about the lens including which color block should be used. The blocker will then use a mechanical arm to pick up the lens with pneumatic suction and place it on the surface where molten wax is pumped through the block and onto the front side of the lens, creating an adhesive that holds the two together as the wax cools and hardens.¹¹

The lens is transported down the conveyor to the generator. The generator has an apparatus with three axes that move the lens as needed to carve out the basic rear curve of the lens. The blade that cuts the lens is made of industrial grade diamond for longer life and more precise cutting. All lenses must have a block attached in order to be compatible with the generator's equipment. The job number is entered into the generator's computer, and each lens must be cut one at a time by the machine. This action can require thirty seconds or more, so a second generator is recommended in order to increase job speed and eliminate delay. The dust created by the lens shavings is directed to waste bins and emptied at the end of every day.¹²

The lenses are then taken to be fitted on to the specific tools. A tool is essentially a steel block that has been shaped to fit the rear side of a lens. Each tool is different, and there are hundreds of different combinations of power ratings. The specific tool needed

¹¹See: <http://www.gerbercoburn.com/products/blockeclipse.htm>

¹²See: <http://www.gerbercoburn.com/products/geniqsl2b.htm>

for the job is given on the work ticket. These tools are picked out by hand on shelves and placed in the tray with the lenses. The tools, much like the blocks discussed earlier, allow for compatibility with the finer and polisher. After the tool is placed with the lens tray and lenses, a plastic sticker with a felt surface is applied to the face of the tool. This sticker is the actual material that makes contact with the lens and smoothes the surface of the lens.

This brings us to the finers and polishers, which work with the tools to finish the surfacing process. When the tool and lens are applied to the finer, the job number is entered into the machine, and it automatically recognizes the type of lens and the necessary action to polish it. Each type of lens material must be polished at different speeds and with varying amounts of water and soap, which is handled by the machine. The machine oscillates the tools against the lenses very quickly, making a random circular motion so as to not create swirl marks. As the lenses are polished, the water is sprayed on them to keep them cool and lubricate the surface.¹³ After the process is finished the tools are washed, dried, and returned to the shelves for future use.

The lenses are placed on a conveyor that moves them to a wash station. Each lens is removed from the block, and the hardened wax is peeled away from the protective tape. The blocks are washed, dried, and returned to the surface blocker. The wax is placed on a drying table to air dry before it can be used to replenish the wax in the surface blocker again. The lenses are washed by hand and the protective tape is removed from the front surface. The lens is now the exact thickness and has the exact surface curve both on the back and front to comply with the prescription required.

¹³ See: <http://www.gerbercoburn.com/products/finpolacuityplus1.htm>

From this point, the lens must be edged to fit the lens into the frame. The job number is once again entered into the edger's computer, and the lens is placed on the internal apparatus. The dimensions of the lens must be cut to fit in the desired frame, but the computer is also programmed to not disturb any multifocal or progressive inserts in the lens. The edger cuts lenses only one at a time, so once again a second edger is recommended to facilitate additional production capacity. The shavings produced as waste from the edger must also be emptied daily.¹⁴

From this point the lens is inspected for flaws and prism under a lens meter. The lens meter inspects the lens for any surface flaws and prism and also identifies the optical center, as well as checking the correctness of the cylinder power and PD (pupillary distance).¹⁵ If mistakes are recognized, then the manager must look at the surface of the lens through a microscope to assess whether there is enough prism in the lens to order a replacement. If there is not, then the lens passes and is inserted into the frames or it is sent to the clean room for hard coating or Anti-Reflective coating. However, if there are flaws prominent enough to be seen by the wearer, then the process starts almost completely over.

Sometimes the lens can be resurfaced, and sometimes a new lens must be taken from inventory and the process be executed again. In the case that the lens can be resurfaced, the surface blocker attaches a block, the generator is skipped, the correct tool is retrieved and it is fined and polished again. It also skips the edger after the block is removed. Again the lens is inspected, and either passes or fails.

¹⁴ <http://www.gerbercoburn.com/products/finkappaedge1a.htm>

¹⁵ <http://www.gerbercoburn.com/products/lensmetrix2.htm>

If the lens is designated to receive further coating, then it is taken to the clean room of the lab. The instructions on the work ticket specify each process it should go through to finish the job. The clean room of a lab consists of a controlled clean air supply and must be kept static-free by ensuring that personnel wear lab coats and pants. The lens is inserted into the vacuum coating equipment and several coats of material are applied to the front, back, or both sides of the lens according to the color desired as well as the type of lens used.

The process of vacuum coating lenses is slightly more complicated than many of the processes aforementioned. The two issues involved are how the lenses are coated and how the coating works. The lenses are inserted into a vacuum coating machine within the clean room of the lab. The machine occupies approximately an entire twelve square foot room. A batch of lenses (the number of lenses depends on the model of machine and how many lenses are needed) is inserted on a tray that sits within a part of the machine that looks similar to an oven, and actually becomes a vacuum for particles. Several tablets of purified metals such as lithium, titanium, and aluminum are inserted into another chamber within the machine. Using electricity, these metals are melted into liquid. As the metals become liquid, they are transported to the oven where the lenses are placed. The liquid is then heated again to the point of evaporation. The liquid evaporates onto the surface of the lens. The process is repeated for as many different kinds of metals as are inserted to attain the desired color and coating sequence. The lenses are allowed to cool and dry, and after approximately an hour and a half, they are ready to be removed from the vacuum.¹⁶

¹⁶ See: <http://www.satis-vacuum.ch/site/productsset.html>

The coating involved is a very technical process. “Thin film anti-reflection coatings greatly reduce the light loss in multi-element lenses by making use of phase changes and the dependence of the reflectivity on index of refraction... The idea behind anti-reflection coatings is that the creation of a double interface by means of a thin film gives you two reflected waves. If these waves are out of phase, they partially or totally cancel.” This is what causes the lenses to appear clearer and non-reflective. Multiple coatings consisting of multiple metals increase the process’s effectiveness. “A single layer anti-reflection coating can be made non-reflective only at one wavelength, usually at the middle of the visible. Multiple layers are more effective over the entire visible spectrum.”¹⁷ “AR is made of a very hard thin film that is layered on the lens. It is made of material that has an index of refraction that is somewhere between air and glass. This causes the intensity of the light reflected from the inner surface and the light reflected from the outer surface of the film to be nearly equal. When applied in a thickness of about a quarter of light's wavelength, the two reflections from each side of the film basically cancel each other out through destructive interference, minimizing the glare you see. AR coatings are also applied to the front of prescription eyewear and some sunglasses to eliminate the ‘hot spot’ glare that reflects off the lens.”¹⁸

These AR coatings serve two basic purposes. The first is to increase the visibility and safety of outdoor activities, especially driving at night. The refraction capabilities of the coatings eliminate glare from other objects as well as the halo effect often seen around lights. The second purpose is for cosmetic reasons. “Anti-reflective coating reduces both internal and external reflections on the lenses themselves, creating a nicer

¹⁷ <http://hyperphysics.phy-astr.gsu.edu/hbase/phyopt/antiref.html>

¹⁸ <http://science.howstuffworks.com/question615.htm>

cosmetic appearance. Internal reflections appear as rings that make lenses look thick. External reflections mask your eyes from a clear, complete view when someone is looking at you. So with an anti-reflective coating, eyeglass lenses appear thin or non-existent, and your eyes look more natural.”¹⁹

Finally, the lenses are inserted into the frames of the buyer’s request. They are lightly buffed with a soft cloth to remove dust or other particles. They are placed into a protective case and shipped to their final destination.

Logistics is a key concern to the arrival of the lenses to the end consumer within the desired amount of time. There are several factors to be taken into consideration when determining the method of logistics. “The firm must consider the physical distribution costs of warehousing, packaging, transporting, and distributing its goods as well as inventory carrying costs and those of its foreign customers...Because exporting means longer supply lines and increased difficulties in communicating with foreign customers, firms choosing to export from domestic factories must ensure that they maintain competitive levels of customer service for their foreign customers.”²⁰ Whitaker Optical will focus primarily on the American market initially because of the advanced transportation infrastructure and the speed of distribution.

¹⁹ <http://www.allaboutvision.com/lenses/coatings.htm>

²⁰ Griffin, Pustay. International Business a Managerial Perspective 3rd Prentice Hall, 2003.

Marketing

Marketing is a crucial division for Whitaker Optical. The marketing involved in targeting the consumers who need eyewear and filling their requests for the product in a short period of time is paramount to the success of the business. In fact, marketing is the most important part of Whitaker Optical because it is a startup company, and all of its customers will be new customers. Furthermore, as the company's success increases, Whitaker Optical will eventually move from a focused ethnocentric orientation that keeps marketing focused on the domestic American market, to a geocentric orientation that markets to the entire world as a "low cost manufacturer and marketer of its product line".¹

Presently the market for eyewear in America is ample to generate income and later expand internationally. "Sixty-one percent of U.S. eyeglass wearers surveyed use only one pair of eyeglasses, however 31% said they use 2 pairs and 8% use 3 or more pairs." The total retail sales in the optical industry, including frames, lenses, and contacts, amounts to approximately 15.3 billion dollars each year for the past four years, and sales are projected to increase as the population ages.²

Whitaker Optical must first address the four principles of marketing, product, price, promotion, and distribution. The product is prescription eyewear, including the lenses and frames. The price is given directly to the customer over the Internet when ordering, and must be less than competitors' while maintaining a profit that creates company solvency. Promotion will be a dual force of advertisement to optical consumers

¹ Lascu. International Marketing. Cincinnati: Atomic Dog Publishing, 2003. p. 8

² Vision Watch, Jobson Optical Research, 2005

and sales representatives in doctors' offices. Distribution will be limited to the United States and will be facilitated by third party distribution systems.

The product Whitaker Optical will sell is more than a basic pair of reading glasses. Many combinations of lenses and frames exist and will be sold as the consumer desires. The frames selection includes modern fashionable frames as well as traditional wire and plastic frames. Flexible wire frames will also be available for a more compact, lightweight, and durable alternative. Many styles are available with almost invisible rims surrounding the lenses, which make the lenses seem as though they are floating for minimum disruption of visibility. Frames will be purchased from wholesale distributors. Each lens will be custom made according to doctor's specifications. To keep maximum quality, the market leader in lens production, Essilor Lenses, will be the standard lens used. By selling only Essilor lenses, Whitaker Optical keeps costs down and builds a productive relationship quickly between the two companies.

Importing of products is a major issue and could potentially cost the company a great deal of investment. Here importing the product is an international venture, as Essilor is a French company and most of the blank lenses the company manufactures are imported from Paris. Here Whitaker Optical is the foreign importer and will utilize the technological know-how and trademark of Essilor to add value to its products. According to deals made between the two companies, payments may be made on a per product basis. Essilor ships its products from its distribution centers in Dallas, Texas to the Whitaker Optical lab in Mexico where they are manufactured into finished eyewear.

The lenses are broken down into four main lens materials: plastic (CR-39), polycarbonate, glass, and high index. Also, Transitions is available and is sold as a different lens material. As discussed in the previous chapter, each has its advantages.

To classify these lenses even further, they can be broken down by three different options: single vision, multifocal, and progressive. Single vision implies that the lens retains the same curve constantly throughout the lens. This means that anywhere the eyes of the wearer move their vision will remain constant without a change in lens power. This type of lens would be prescribed for every-day eyewear that one would need for normal activity. Multifocal refers to lenses that have inserts within them that adjust power as needed with eye movement. This group includes bifocals, but is not limited to bifocals. With multifocal lenses, the wearer may continue daily activity as well as reading activity without needing two pairs of glasses. When a multifocal wearer moves his eyes down the power of the insert within the lens is stronger, and therefore magnifies the print on the page to facilitate reading. Finally, a progressive lens refers to eyewear that is similar to multifocal in benefits, but is clearer and less taxing on the eye. Whereas a bifocal has a distinct insert within the lens that magnifies vision, a progressive lens, as the name implies, progressively adjusts power as the eye moves. Therefore there are no lines on the lens surface, and because the power progressively increases in the reading position, focusing is more gradual and easier on the eye.

While single vision lenses and multifocals continue to compose fifty percent of the lens market, progressives are constantly gaining market share. The two principal reasons for this growth are the increased promotion of progressives by retailers and the gradual acceptance of the benefits of progressives by consumers. Retailers promote

progressives not just because they are more advanced technologically, but also because they produce higher profits. Progressive lenses are considerably more expensive than single vision and multifocals, and therefore they create higher profits for wholesalers and retailers. Consumers, not oblivious to the greater prices are now realizing that the benefits are worth the additional cost. Approximately 50 percent of today's prescriptions are progressive style lenses, and 21 percent have anti-reflective coating.³

The treatments for the lenses are anti-scratch coating, polarization, and anti-reflective coating. While the first two treatments are done during the manufacture of the blanks, and would therefore not be in the scope of Whitaker Optical, the anti-reflective coating is done within the lab. This coating, as mentioned above, is only applied to 21 percent of total eyewear. AR coating is another high cost process that increases the final price to customers and raises profits for labs. As is true with progressives, when customers purchase AR coatings, everyone wins.

For Whitaker Optical to obtain a sufficient amount of initial capital, an additional product line will be offered which is completely uninvolved with the lab. Because of their popularity, sunglasses will also be added to the product mix. There are several reasons why sunglasses will be included in the product mix, including the ease of which they can be obtained, the sufficient profits that are obtained from their sale, and the market boost that they provide.

Whitaker Optical will become a seller for several sunglass distributors throughout the country. Throughout the country many labs buy sunglasses wholesale direct from the manufacturer, and become distributors of the products. As distributors, they buy the products, mark the products up to obtain a small amount of profits, and sell them to a

³ VisionWatch, Jobson Optical Research, 2005

retailer. They do not sell directly to the end consumer. Instead they sell to eye doctors or specialty stores, which further mark up the prices an additional 40%. Whitaker Optical will bypass these doctors and specialty stores and sell sunglasses over the Internet with a much smaller profit margin, closer to 15%.

Because the market for sunglasses is so competitive, few retailers sell their products for less than the retail price. They feel there is no need to compete by offering lower prices, and they mark up their prices according to the inflated level of the industry. Whitaker Optical will buy from the distributor and only markup their product half as much as doctors and specialty stores, and will obtain a greater volume of slightly smaller profits. Because there is no manufacturing or customization involved, Whitaker Optical adds little value to the product, but obtains a substantial profit.

The market for sunglasses includes many young people. They generally want to buy more pairs because they want to continually have the most up-to-date styles and fashions. This helps Whitaker Optical to market to the lower end of its 18-55 year-old market, and raise profits to help fund the other parts of the business. When the younger customers purchase these sunglasses, they inadvertently see that Whitaker Optical sells prescription eyewear as well. They become familiar with the brand name, and as they age and need corrective eyewear, they will have bought several pairs of sunglasses from the website. By this time, they will be familiar with its operation and the speed at which the products are delivered, thus making Whitaker Optical the first place they look for corrective products.

Whitaker Optical must next promote its products. The eyewear will be promoted as a necessity good, but it will also be marketed to show a distinction in higher quality by using the Essilor name and boasting the individual attention that each pair of glasses receives. By proving to the customer that he is in control of the design and function specifications of his eyewear and allowing him to complete his order personally on the website shows him the complete customization of his job. Part of the attraction of Whitaker Optical is the idea that the customer directly requests the product he will receive specifically according to his preference. This kind of marketing has proven successful for online companies such as Dell, which sells its products entirely online and individually customized.

Promotion will first be dedicated to eye care doctors. Promotion to the doctors' offices will rely on the creation of many business relationships. At this stage of operation, the necessity for sales representation becomes evident. Therefore two sales representatives positions will be formed to cover the eastern and western United States. These representatives are charged with signing on doctors, both optometrists and ophthalmologists, to become partners with Whitaker Optical. They are also responsible for maintaining advertisement in the offices at the point of purchase. Their job is similar to that of any other sales representative from current labs, except under the current lab operation, the eyewear is sent back to the doctor from the lab, and then to the patient, whereas Whitaker Optical sends eyewear directly from the lab to the customer's address.

The industry standard for sales representatives is described below. Figure 2.1 is an example of a sales representative position posting.⁴

⁴ Posting is modified from an Essilor Human Resources document, with permission.

POSITION POSTING

Title: Sales Consultant	Territory: Eastern/Western United States
Reports To: William Whitaker, Sales Manager	
Department: Selling	

POSITION PURPOSE:

The Sales Consultant is responsible for achieving sales objectives and growing sales volume within targeted accounts in an assigned territory. Implementing corporate sales direction and marketing strategies, the Sales Consultant fosters a professional business relationship with new and existing ECPs to insure maximum support of Whitaker Optical. The Sales Consultant presents a professional image and maintains Whitaker Optical's position as a leader in the ophthalmic industry.

PRIMARY RESPONSIBILITIES:

1. To continually increase sales of Whitaker Optical Products by achieving forecasts.
2. To meet budget for territory.
3. To create and increase demand for Whitaker Optical Products and achieve maximum usage in his or her territory through personal sales effort.
4. To target existing and potential accounts through accurate and ongoing account classification.
5. To educate, train and ultimately achieve a "trusted advisor" consultant role within target accounts
6. To always represent the company in line with stated core values and mission statement.
7. To facilitate the interaction and communication between patients and the ECPs.
8. To promote other Whitaker Optical products as directed by the company.
9. Meet or exceed the requirements set forth in Whitaker Optical's policies.
10. Communicates in a professional and timely manner with the ECP customers, Lab customers and all personnel.
11. Completes and submits reports and other requests in an accurate and timely manner.
12. Respects and effectively utilizes all company productivity tools to maximize job efficiency.
13. Creates a safe work environment through awareness and adherence to proper safety procedures.
14. Other duties as assigned.

EDUCATION AND QUALIFICATIONS:

- B.B.A./B.S./B.A degree in an appropriate discipline preferred or related experience.
- A minimum of two years successful outside sales experience.
- A proven, documented record of solid sales achievements.
- Excellent communications skills.
- Demonstrated computer skills.
- Demonstrated presentation skills.
- Current and valid driver's license.
- Must be willing and able to travel overnight.

Figure 2.1 Job Position Posting

Promotion to customers is also a high priority. Consumers must realize that Whitaker Optical not only exists, but is also a viable and beneficial option for purchasing their next pair of glasses. Promotion of Whitaker Optical will rely mostly on doctors' recommendations, word of mouth, and point of purchase advertisement. When a partnership is formed between eye doctors and the company, doctors will promote the company because it will in turn promote their practices, a cooperation which is explained later. Word of mouth is an obvious necessity for startup companies that builds customer bases exponentially.

Advertising is a vital operation that Whitaker Optical must undertake. As mentioned above, eyewear is not a product that creates buyers. Rather the need for eyewear is born of necessity. Therefore advertising for Whitaker Optical should not focus on obtaining customers from mass advertising such as television, radio, or billboards. The most effective method will be placing advertisements in independent optometrists' offices where the consumer will go for an exam. Here the market is cornered; the customer has three basic options: filling the order with the in-house optometrist for the highest cost and waiting time, going to a mass retailer with a high cost and short waiting time, or sending the information to Whitaker Optical online, and saving money as well as time and effort.

However, getting the independent optometrists to agree to allow this in-house advertising is difficult. After all, their labs will be losing business (more so than they already are as shown by Figure 2.2) by giving jobs to Whitaker Optical. So in exchange for allowing Whitaker Optical to advertise in their office, their business information such as phone number and location is promoted on the Whitaker Optical website as a partner

optometrist. Using the website to search for a local optometrist will lead users to the optometrist cooperating with Whitaker Optical, thus increasing his advertising without increasing his costs. As the cooperation grows and become more profitable for both entities, so does the number of optometrists who are willing to promote this method. Optometrists must realize that specialization in the industry must occur like other American industries, and their labs are becoming obsolete because their quality can be matched and their prices can be beaten. Whitaker Optical will help them to abandon their labs, thus cutting production and payroll costs, and will increase their examination volume, replacing the income lost from manufacturing eyewear.

The content of the doctor's office advertising will consist mainly of comparative advertising. The advertisement should look fairly simple and be a poster or placard at the point of payment that will give the customer the opportunity to weigh the three options. By displaying a sample pair of eyewear from the three options of an independent lab, a mass retailer's lab, and Whitaker Optical, customers can compare the three products and decide for themselves which is the best option.

Interestingly, an increasing trend in the optical industry is that customers are visiting their independent optometrist and taking their optical prescription to be filled elsewhere, namely Lens Crafters or Wal-Mart. Obviously these companies have made their business from undercutting the independent optometrists and providing products for a reduced cost. Figure 2.2 is the market research from Jobson that shows the drastic decrease in eyewear dispensed at independent optometrists in comparison to the number of patients that are given eye exams.

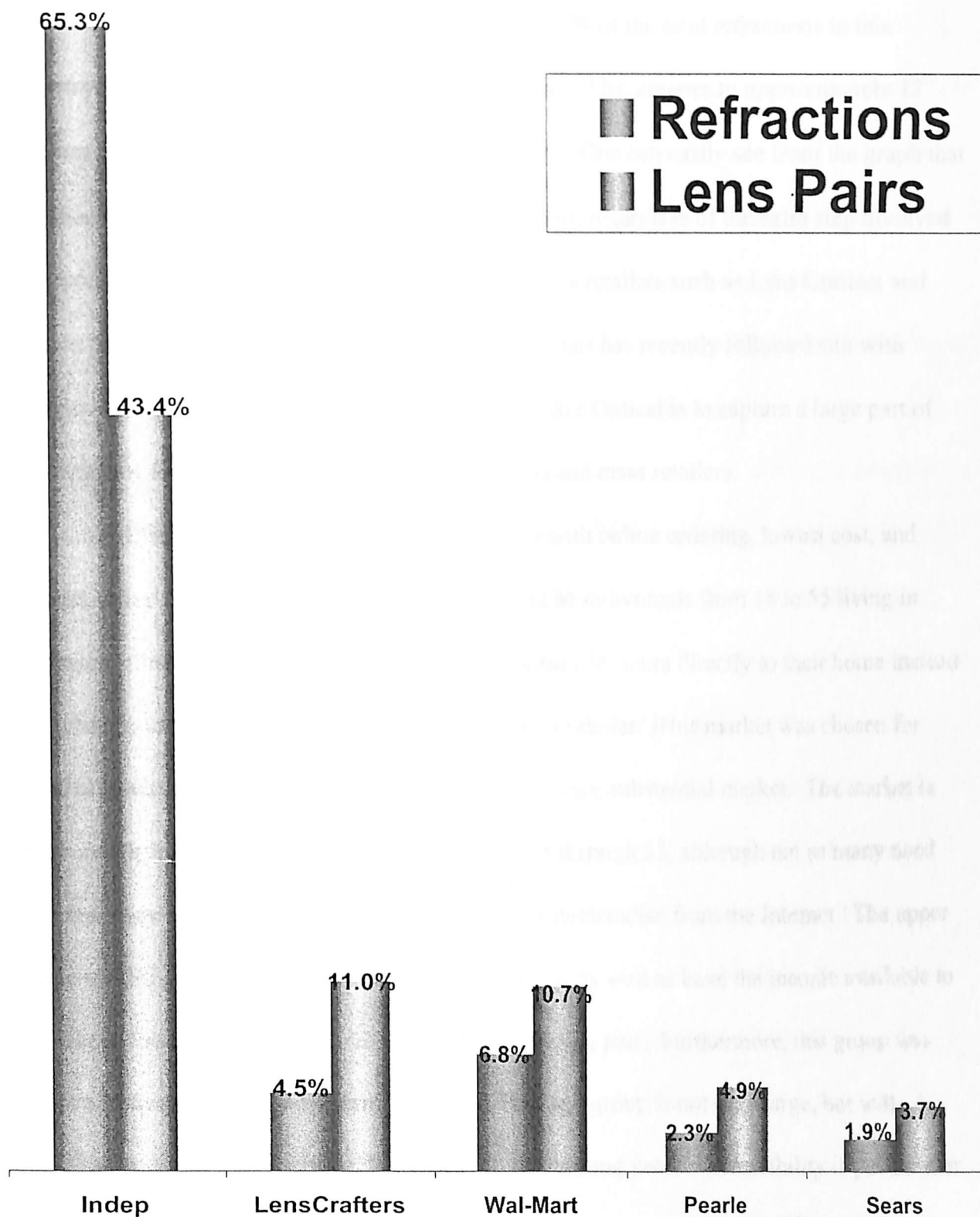


Figure 2.2 Jobson Market Research

“We know that independents perform 65.3% of the total refractions in this country, but sell only 43.4% of the lens pairs sold. That equates to approximately 17 million lens pairs lost by the independent sector”.⁵ One can easily see from the graph that the market trend is to buy eyewear at the least cost, regardless of the extra step involved in traveling to another location to do so. The mass retailers such as Lens Crafters and Pearle have been doing this for years, and Wal-Mart has recently followed suit with increasing success. Therefore the goal of Whitaker Optical is to capture a large part of that market from both independent optometrists and mass retailers.

Whitaker Optical will attract customers with online ordering, lowest cost, and fastest order fill time. The target market would be individuals from 18 to 55 living in America who prefer having items delivered within 48 hours directly to their home instead of fighting crowds and waiting in lines at a mass retailer. This market was chosen for several reasons. The first reason was that it is a very substantial market. The market is large enough because in the lower ages from 18 through 35, although not as many need glasses, they are most likely to use and to buy merchandise from the Internet. The upper range of the group is more likely to need eyewear as well as have the income available to buy their first pair, upgrade, or duplicate an existing pair. Furthermore, this group was chosen because of its long-term stability. This age group is not only large, but will continue to exist and increase in number in the coming years. Accessibility is yet another condition that makes this group ideal. There are many ways to access this market easily. Because eyewear is often a necessity more than a want or desire, the consumers will seek out the best method of obtaining the best products for the best value, instead the company actively searching for new customers.

⁵ Vision Watch, Jobson Optical Research, 2005

Obviously in order to receive the number of orders needed to keep the company alive, the numbers will be somewhat large. If the plant's daily capacity is 550 pairs, then the monthly capacity is 12,650 pairs, and 151,800 pairs yearly. According to the research, only around forty percent of wearers have more than one pair of eyeglasses, so there must be a concerted effort to advertise to the thousands needed to make the company solvent. One must remember that to expect 550 new orders from the first day is nearly impossible. The number will gradually rise from zero and then will take on as many more as possible until around 550. Once the output achieves that level, then the company will have to undergo serious changes concerning structure.

When customers visit the doctor to have their eyes checked, they visit either an optometrist or an ophthalmologist. Some optometrists have labs of their own and will be resistant to outsourcing their manufacturing jobs to Whitaker Optical. Those labs are considered competitors similar to Wal-Mart or any other independent lab until they can be acquired. When a patient visits an optometrist, he undergoes the standard tests of what type of curved lens can be beneficial to his sight. The optometrist then fills a prescription for the lens specifications. This process is precisely the operation of Lens Crafters or Pearle. They generally manufacture the lens in their own lab and have the prescription ready within a day. However, the customer is not required to buy from the location where his eyes are examined. He is entitled to his prescription information, and he may choose to walk out of the office and purchase his eyewear elsewhere. This is where Whitaker Optical must give a financial incentive and have a perceived value greater than that of competitors. The customer must be willing to leave the store and wait one additional day more than they would at Lens Crafters or Pearle.

At an ophthalmologist office, the customer rarely has the option of buying his eyewear in the office because these doctors are less interested in selling lenses and are more interested in surgical procedures that earn them more money. Few, if any, labs exist in conjunction with ophthalmologists. Therefore this type of doctor's office is a great market for customers. When the ophthalmologist diagnoses their problem, and surgery is unnecessary, they refer Whitaker Optical for eyewear. These doctors will be compensated accordingly with publicity on the website, or monetarily for a percentage of the sales resulting from their referrals.

The market environment for the eye correction business is extremely competitive. Not only are more traditional eyewear manufacturers competing for the multi-billion dollar industry, other companies have entered the market. Contact lens manufacturers pose a threat to traditional eyewear, but their market is limited because contacts provide more of a cosmetic alternative rather than a functional advantage. Therefore they mainly appeal to younger consumers than the entire range of the potential market. Another threat to traditional eyewear is surgical corrective measures. Several surgeries in recent years have become popular and effective in correcting eye problems. "Radial Keratotomy or RK and Photorefractive Keratectomy or PRK are other refractive surgeries used to reshape the cornea. In RK, a very sharp knife is used to cut slits in the cornea changing its shape. PRK was the first surgical procedure developed to reshape the cornea, by sculpting, using a laser".

Many questions have been raised about surgical methods and their effectiveness as well as their capture of the optical market. LASIK refractive corrective surgery has certainly been an interesting and much-publicized solution for eye deficiency. "LASIK is

a surgical procedure intended to reduce a person's dependency on glasses or contact lenses... LASIK stands for Laser-Assisted In Situ Keratomileusis and is a procedure that permanently changes the shape of the cornea, the clear covering of the front of the eye, using an excimer laser. A knife, called a microkeratome, is used to cut a flap in the cornea. A hinge is left at one end of this flap. The flap is folded back revealing the stroma, the middle section of the cornea. Pulses from a computer-controlled laser vaporize a portion of the stroma and the flap is replaced.”

A candidate requesting LASIK surgery must be what is referred to as a perfect candidate, meaning they cannot have certain pre-existing conditions without encountering serious problems during or after the surgery. Some of the risks involved with LASIK include vision loss, debilitating visual symptoms, under treatment, over treatment, severe dry eye syndrome, and diminishing results after time. Also LASIK is new and potentially dangerous. “LASIK is a relatively new technology. The first laser was approved for LASIK eye surgery in 1998. Therefore, the long-term safety and effectiveness of LASIK surgery is not known”.⁶ The vision impaired must also consider the cost of LASIK surgery, “On average, in the U.S., the cost for LASIK surgery is \$2,000 per eye”.⁷

According to Jobson, the visually impaired that elect to employ a surgeon to perform refractive surgery is increasing, but at what appears to be a very slow climb from 1.5% of the market in 2002 to 2.4% in 2004. These numbers are miniscule in comparison to the 67% of the market captured by prescription eyewear, and when the 22% percent of the market attributed to contact lenses is factored in, 89% of eyewear purchased is

⁶ <http://www.fda.gov/cdrh/LASIK/default.htm>

⁷ http://www.noglasses.com/vision_correction_cost.html

prescription eyewear.⁸ The way for Whitaker Optical to capture their share of the market is to undercut independent and mass retailers by offering the same products for lower costs, making them available more conveniently and quickly.

When a doctor informs a patient that he is not a good candidate for corrective surgery, the patient's vision is not cured. That means that their vision correction will rely on prescription eyewear. A look at the market research reveals that sixty-five percent of the 76.4 million people that have had their eyes examined by mass retailers and independents are interested in purchasing glasses within the next six months. Of the 52,000,000 refractions performed last year in independent doctors' offices, 25,000,000 of the patients tested did not purchase eyewear from that office.⁹ That means that a large percentage is taking the extra time and effort to purchase their eyewear elsewhere for less money. Considering the 25,000,000 patients that don't buy from independents Whitaker Optical has a monumental opportunity. Considering the average overall cost of a pair of eyeglasses is \$227, Whitaker Optical has a great deal to gain ($25 \times 227 = \$5,675,000,000$). That is the market that Whitaker Optical must obtain a part of.

Next Whitaker Optical must consider pricing. A pricing strategy must be ascertained that keeps Whitaker Optical competitive on profit margins while still undercutting mass retailers. The goal for Whitaker Optical will be to make more total profit than mass retailers while gaining less per item profit than independents. The central plan to achieve this goal is to begin building volume. During the early stages of company operation job orders will be few, but as the demand increases and customers become aware of the company, more orders will arrive. Therefore initially prices may be

⁸ Vision Watch, Jobson Optical Research, 2005

⁹ Vision Watch, Jobson Optical Research, 2005

set only nominally lower than competitors at the supermarket. Profits will be low and possibly negative. As more orders are received, the prices to customers can decrease accordingly, and because of an increase in volume, profits will increase at a decreasing rate.

The price of Whitaker Optical's eyewear to consumers will depend greatly on the costs it incurs from its wholesalers. The average pair of lenses purchased from Essilor by Whitaker Optical will cost approximately \$55.40. This number is merely an average, and is representative of the exact same cost that Wal-Mart and any independent labs must pay. This number was obtained from the spreadsheet data in Figure 2.3.

RELEASE DATE	ITEM TYPE	PROD CAT.	5	6	7	8	
JUL-03	S788	507	OVATION NEXT GENERATION N BROWN	\$63.74	\$62.50	\$61.24	\$61.24
MAR-03	S978	559	OVATION THIN & LITE 1.67	\$51.40	\$50.12	\$48.90	\$48.90
MAY-03	S535	426	SFSV AIRWEAR TRANSITIONS (SPHERICAL)	\$31.40	\$31.28	\$31.12	\$31.12
MAY-03	S556	543	SFSV 1.67 SPHERICAL HC	\$31.58	\$30.94	\$30.32	\$28.18
MAY-03	F545-F549	560	FSV 1.67 SPHERICAL HC	\$23.46	\$23.00	\$22.56	\$22.56
APR-03	S980	538	VARILUX PANAMIC POLARIZED BROWN	\$82.40	\$80.62	\$78.86	\$77.98
MAR-03	S537	325	VARILUX COMFORT AIRWEAR TRANSITIONS GRAY	\$73.20	\$71.64	\$70.02	\$69.88
SEP-03	F826 & F829	882	FSV THIN & LITE 1.67 CRIZAL (ASPHERIC)	\$49.00	\$45.80	\$42.00	\$42.00
SEP-03	F831 & F834	881	FSV THIN & LITE 1.67 CRIZAL (SPHERIC)	\$49.00	\$45.80	\$42.00	\$42.00
OCT-03	S543	564	COMFORT THIN & LITE 1.67	\$56.14	\$54.96	\$53.78	\$53.48
FEB-04	F755-F759	583	FSV THIN & LITE 1.67 REFLECTION FREE NP	\$31.62	\$30.58	\$29.98	\$29.98
MAR-04	S900	879	OVATION AIRWEAR POLARIZED GRAY	\$69.60	\$68.56	\$67.24	\$67.24
OCT-04	S904	886	OVATION AIRWEAR POLARIZED BROWN	\$69.60	\$68.56	\$67.24	\$67.24
MAR-04	F760-F764	590	FSV RF NP 1.5 UV	\$17.74	\$16.84	\$15.16	\$15.16
APR-04	S056	585	ELLIPSE ORMA HC	\$40.38	\$39.56	\$38.72	\$38.34
JUN-04	S872	605	ELLIPSE 1.67	\$58.96	\$57.70	\$56.48	\$56.16
MAY-04	S498	630	OVATION AIRWEAR TRANSITIONS BROWN	\$66.54	\$66.24	\$65.36	\$65.36

APR-04	F835-839	593	FSV POLY SPH SAFETY 2 MM	\$4.64	\$4.56	\$4.40	\$4.40
JUN-04	S905	888	PANAMIC AIRWEAR POLARIZED GRAY	\$85.68	\$83.84	\$82.00	\$81.08
AUG-04	S906	889	PANAMIC AIRWEAR POLARIZED BROWN	\$85.68	\$83.84	\$82.00	\$81.08
	S910	581	COMFORT POLY AR	\$50.62	\$49.68	\$48.74	\$48.26
JUL-04	S874	604	LIBERTY ORMA HC	\$37.78	\$37.02	\$36.22	\$35.86
JUL-04	S876	609	LIBERTY AIRWEAR	\$45.34	\$44.42	\$43.48	\$43.04
AUG-04	F511-F515	629	ORMA FSV CRIZAL ALIZE	\$30.98	\$29.70	\$26.26	\$26.26
AUG-04	F735-F739	632	FSV AIRWEAR ASP CRIZAL ALIZE	\$35.02	\$32.74	\$30.04	\$30.04
AUG-04	F745-749	633	FSV AIRWEAR SPH CRIZAL ALIZE	\$32.10	\$30.00	\$27.50	\$27.50
NOV-04	S877	603	LIBERTY 1.5 TRANSITIONS	\$67.72	\$66.28	\$64.82	\$64.10
NOV-04	S907	890	SFSV AIRWEAR POLARIZED GRAY	\$25.90	\$25.00	\$24.58	\$24.58
NOV-04	S908	891	SFSV AIRWEAR POLARIZED BROWN	\$25.90	\$25.00	\$24.58	\$24.58
SEP-04	S871	606	ELLIPSE AIRWEAR	\$48.42	\$47.44	\$46.46	\$45.96
OCT-04	F716-F719	638	FSV 1.67 ASP CRIZAL ALIZE	\$57.76	\$53.98	\$49.50	\$49.50
OCT-04	F711-F714	639	FSV 1.67 SPH CRIZAL ALIZE	\$57.76	\$53.98	\$49.50	\$49.50
MAR-05	S596	679	SFSV AIRWEAR SPH TRANSITIONS V GRAY	\$31.40	\$31.28	\$31.12	\$31.12
FEB-05	S568	670	SFSV AIRWEAR AS TRANSITIONS V GRAY	\$31.40	\$31.28	\$31.12	\$31.12
FEB-05	S569	671	SFSV AIRWEAR AS TRANSITIONS V BROWN	\$31.40	\$31.28	\$31.12	\$31.12
FEB-05	S566	662	OVATION AIRWEAR TRANSITIONS V GRAY	\$66.54	\$66.24	\$65.36	\$65.36

FEB-05	S567	669	OVATION AIRWEAR TRANSITIONS V BROWN	\$66.54	\$66.24	\$65.36	\$65.36
FEB-05	S595	678	NATURAL AIRWEAR TRANSITIONS V GRAY	\$63.36	\$63.08	\$62.24	\$62.24
JAN-05	S563	666	SFSV AS 1.67 TRANSITIONS V GRAY	\$50.70	\$50.50	\$50.00	\$50.00
JAN-05	S599	682	SFSV AS 1.67 TRANSITIONS V BROWN	\$50.70	\$50.50	\$50.00	\$50.00
JAN-05	S570	672	OVATION 1.67 TRANSITIONS V GRAY	\$85.70	\$85.36	\$84.50	\$84.50
JAN-05	S598	681	OVATION 1.67 TRANSITIONS V BROWN	\$85.70	\$85.36	\$84.50	\$84.50
FEB-05	S562	665	COMFORT AIRWEAR TRANSITIONS V GRAY	\$75.40	\$73.80	\$72.12	\$71.98
JAN-05	S564	667	COMFORT 1.67 TRANSITIONS V GRAY	\$88.44	\$86.72	\$85.00	\$85.00
FEB-05	S560	663	PANAMIC AIRWEAR TRANSITIONS V GRAY	\$80.96	\$79.24	\$77.44	\$76.58
MAR-05	S561	664	PANAMIC AIRWEAR TRANSITIONS V BROWN	\$80.96	\$79.24	\$77.44	\$76.58
JAN-05	S499	660	PANAMIC 1.67 TRANSITIONS V GRAY	\$95.72	\$93.84	\$92.56	\$92.00
MAR-05	S574	677	ELLIPSE AIRWEAR TRANSITIONS V GRAY	\$79.18	\$77.50	\$75.74	\$75.58
APR-05	S597	680	ELLIPSE AIRWEAR TRANSITIONS V BROWN	\$79.18	\$77.50	\$75.74	\$75.58
JAN-05	S539	687	ELLIPSE 1.67 TRANSITIONS V GRAY	\$91.90	\$90.10	\$88.32	\$88.32
APR-05	S637	685	LIBERTY AIRWEAR TRANSITIONS V GRAY	\$71.64	\$70.12	\$68.52	\$68.38
JAN-05	S869	636	ELLIPSE 1.50 TRANSITIONS GRAY	\$72.56	\$71.00	\$69.46	\$68.68
JAN-05	S868	635	ELLIPSE 1.50 TRANSITIONS GRAY UC	\$72.56	\$71.00	\$69.46	\$68.68
JAN-05	F123- F126	661	FSV THIN & LITE 1.6 AS	\$21.04	\$20.64	\$20.24	\$20.24

Figure 2.3 Wholesale Lens Price List

Figure 2.3 is condensed from an actual pricing spreadsheet of Essilor, which lists all the prices for some of their most recent product releases. The version containing a list of their entire product line is too lengthy to include within the pages of this model, but the averages are very similar. The average price of \$55.40 mentioned above refers to the sum of the prices in column number six divided by the 53 lens types. Column six refers to the price set forth by Essilor headquarters at which it will sell at a specific volume. Notice that as the column number increases, the price of each pair decreases. This means that as the customer increases its buying volume, Essilor sells their products for a gradually more discounted price. According to Essilor, a lab that produces 500 to 700 jobs per day would fall into the sixth column, and with the initial production goal of Whitaker Optical being approximately 550, that is the category into which the company is classified.

Recalling what the labor costs of Whitaker Optical would be from the Manufacturing chapter, around 73 cents per pair, that total is added to the cost of each average pair, around \$55.40, and the sum is \$56.13 average cost per pair of lenses. Competitors' costs would be much greater because of the increased American labor wages. Their per unit costs would be closer to \$58.06 ($55.40 + 2.66$). That means that each average pair costs Wal-Mart or an independent lab \$1.93 more to produce than each pair costs Whitaker Optical to produce.

Now the price to the customer must be considered. According to Jobson, the average price of a pair of lenses, as an aggregate, is \$110 to the customer. That means that the markup is nearly 100 percent! Obviously there is a substantial amount of space

within that 100 percent markup that Whitaker Optical can negotiate to obtain optimal profits while remaining more cost effective than its competitors.

There are three levels to price management for any company. The first is industry supply and demand. "Changes in supply (plant closings, new competitors), demand (demographic shifts, emerging substitute products), and costs (new technologies) have very real effects on industry price levels". All of the above factors have been determined such as the substitute of LASIK surgery and other market conditions. "This knowledge allows managers not only to predict and exploit broad price trends but also to foresee the likely impact of their actions on industry price levels". Whitaker Optical must adjust prices according to the market in order to stay competitive.

The second level is product market strategy. Customers will perceive the products from Whitaker Optical as the best in the industry and comparable in quality and style to other industry leaders. Yet the separating issue is the idea that customers can access all of Whitaker Optical's products online and they can be shipped to the customer within two business days. These are the factors that the customers perceive as valuable, and price will be contingent on these aspects. "Market research tools, like conjoint analysis and focus groups, can help managers understand customer perception of benefits. And understanding at this second level of price management helps guide both the product's price positioning and the fine-tuning of product and service offerings".

The third level is the transaction level. "At this level of price management, the critical issue is how to manage the exact price charged for each transaction – that is, what base price to use, and what terms, discounts, allowances, rebates, incentives, and bonuses

to apply”.¹⁰ At the transaction level, each operation is micro-managed and every reduction and increase in price is considered. Whitaker Optical, much like Wal-Mart, will not offer promotional discounts. The prices will consistently be as low as possible while continuing to obtain a desired level of profit. However, that is not to say that each pair of glasses sold will not receive individual attention. In fact, the method used to obtain eyewear will seem more personally involved than the checkout counter. Each option available will be listed as the customer requests it, and they can see the way each individual choice affects the price.

For Whitaker Optical, price is paramount. The price of direct materials into the production is virtually the same as any other lab. The overhead costs are basically the same as an American competitor. The savings come from fewer taxes and a much lower direct labor cost. Ultimately Whitaker Optical has more leverage than competitors regarding price, and it can sell its products at a slightly reduced price than competitors. According to Jobson, the average pair of finished eyewear is \$227. If Whitaker Optical sells the same eyewear for the same price, it will obtain a slightly higher profit.

The daily revenue of 550 pairs of glasses per day would be \$124,850, not including sunglass sales. The revenue for any other lab selling the same quantity would be very similar. The costs of purchasing the direct materials (lenses) are \$30,470 ($\55.40×550). The difference comes from the \$1,073 ($\$1,472 - 399$) savings in labor costs. Holding overhead and indirect costs constant for both Whitaker Optical and any other lab, that money can be taken completely as profit, or can be used to decrease the end consumer price to attract more business.

¹⁰ Michael Marn, Robert Rosiello, “Managing Price, Gaining Profit”. Harvard Business Review No. 92507

By utilizing the lab cost model “Wholesale Lab Analysis” provided in Microsoft Excel form, one can find exactly the specific costs of managing a lab. Everything from staff wages to indirect materials is incorporated into the budget analysis. As numbers are entered into the cells, costs are computed and tallied. Figure 2.4 displays the actual costs of the materials of Whitaker Optical as a whole, not just the most modern lens options. It also includes all numbers pertaining to lab management. This table was developed by Essilor and was modified to account for the variables of Whitaker Optical.

Consumables, Labor, & Material Costs

Consumables Cost:	per lens	[----- Labor Cost per Job Handled -----]			
<u>Office</u>					
Order Pads	\$0.04	per hour	current count	proposed count	
Supplies	\$0.10				
Misc. Items	\$0.02				
Per Lens Total	\$0.16				
<u>Surface</u>					
Surface Saver Tape	\$0.05				
Alloy/Wax Material loss	\$0.05				
Generator/Cutter Blade Wear	\$0.03				
Generator Coolant	\$0.02				
Paper & Misc. Items	\$0.15				
Fining Pads	\$0.11				
Polishing Pads	\$0.13				
Polish	\$0.03				
Coatings	\$0.03				
Per Lens Total	\$0.60				

Labor Cost:	per hour	current count	proposed count
Average OFFICE Hourly Wage	\$2.66	8.5	9.3
Average SURFACING Hourly Wage	\$2.66	4.0	4.4
Average FINISHING Hourly Wage	\$2.66	5.5	5.8
Average AR (in house) Hourly Wage	\$3.50	4.0	4.2
Average SHIPPING Hourly Wage	\$2.66	1.5	1.8
Average (total):	\$2.07	23.5	25.5

Rx Material Cost:	per pair	per lens	by volume
CR-39 Average	\$12.00	\$6.00	\$1,630.20
Polycarbonate Average	\$21.00	\$10.50	\$7,132.13
Mid-Index Average	\$20.00	\$10.00	\$0.00
Hi-Index Average	\$23.00	\$11.50	\$420.61
Other Index Average	\$25.00	\$12.50	\$0.00
Glass Average	\$0.00	\$0.00	\$0.00
	\$ 17.58	\$8.79	\$9,182.94

Rx Consumables + Labor + Material Cost:	[----- Per Job -----]	
	CURRENT	PROPOSED
Office / job	\$17.33	\$17.36
Surface / job, adds	\$1.39	\$1.41
Finish / job, adds	\$0.74	\$0.76
AR / job, adds	\$7.50	\$7.55
Shipping / job, adds	\$0.27	\$0.28
TOTAL COSTS =	\$27.22	\$27.35

<u>AR (in house)</u>	Per lens
Coatings	\$2.00
Machine Use	\$0.75
Cleaning	\$0.50
Paper & Misc. Items	\$0.05
Per Lens Total	\$3.30
<u>Shipping</u>	per lens
Boxes / Envelopes	\$0.08
Postage	\$0.00
Paper & Misc. Items	\$0.03
Per Lens Total	\$0.11

Average Rx Shipped Work %:			
	CR-39 Average	# Jobs	% Vol
	Polycarbonate Average	143.0	26.0%
	Mid-Index Average	357.5	65.0%
	Hi-Index Average	0.0	0.0%
	Other Index Average	19.3	3.5%
	Glass Average	0.0	0.0%
		30.3	5.5%
		550.0	100.0%

Figure 2.4 Optical Lab Operations Costs

Distribution should be the least complex facet of marketing Whitaker Optical.

Whitaker Optical's products will be shipped via a third party mail carrier such as Fed Ex and UPS at the expense of the customer. This shipping and handling fee is standard with all online retailers, and customers are usually accustomed to paying extra cash to receive orders in the mail.

Distribution will be focused on American consumers primarily because the payment system is easier, and the delivery time is an important factor for the company. There are several states in which a company must be licensed by the American Board of Opticianry to dispense prescription eyewear including Alaska, Arizona, Arkansas, California, Connecticut, Florida, Georgia, Kentucky, Massachusetts, Nevada, New Hampshire, New Jersey, New York, North Carolina, Ohio, Rhode Island, South Carolina, Tennessee, Texas, Vermont, Virginia, and Washington. However, because of interstate commerce laws, Whitaker Optical is exempt from this necessity that hinders other brick and mortar companies in the optical field. However if international customers are willing to pay the extra cost of international shipping, the products will be made available to them without the guaranteed 60-hour delivery time.

Conclusion

Whitaker Optical is a company that combines several standards with some new ideas that are not currently in place throughout the optical industry.

The ideas set forth in the manufacturing section follow the guidelines of traditional labs in equipment and methods of production, but there are some key differences in the management. The inventory will be managed by a JIT system, unlike current inventories that keep thousands of lenses in stock at any one time. Orders are taken over the Internet and are directed through the facility via computers, decreasing the need for an abundance of customer service representatives. Employees that are involved in the early stages of the manufacturing process will arrive earlier than those involved in the later stages. This way there are no jobs left over for the next day, and all orders are expedited. The lab will also be customized for lens production to increase efficiency of production speed, whereas most labs in America are converted warehouse space. Most importantly for the success of Whitaker Optical is the fact that the manufacturing lab is located in Mexico to utilize the Mexican labor force. Mexican productivity levels are close to ninety percent of American laborers, steadily improving, and wages are less than a third of domestic wages.

Whitaker Optical also approaches marketing differently. By using the Internet, customers are given options for their needs. They can see each customization, and they know that they will receive the exact product that they desire, in a short period of time. Whitaker Optical will advertise via doctors' offices to reach target markets more effectively, making advertising dollars fewer and more focused. Two sales representatives will make sure to keep these offices happy with Whitaker Optical and

reward their patronage with additional internet customer referrals. The prices for the customer will be competitive with other mass retailers such as Wal-Mart and Lens Crafters, and the quality will be superior, while earning Whitaker Optical a higher profit margin. Whitaker Optical's products will be the best available in the market today featuring progressive lenses, anti-reflective coatings and any other option facilitated by modern optometry.

To analyze the possible success or failure of Whitaker Optical there are several critical factors to consider. The external economic factors of the optical industry and the company's internal strengths and weaknesses must be analyzed. The competence of the answers to these questions can predict the success of Whitaker Optical.

What are the key trends and issues in the industry? The trend for the optical industry is an increase in volume of total customers. The baby boomer generation is well into an age category that most people need vision correction, and they are searching for safe, viable, and affordable solutions. The key issues facing the optical industry in the future are competition with surgical methods such as LASIK surgery as well as contact lenses. However, in an industry that generates over \$15.3 billion per year, there is plenty of room to capture market share.

What are some of Whitaker Optical's competitive advantages? One competitive advantage is the savings on wages for lab employees. By eliminating three times the amount of wages paid by an American competitor of the same size, Whitaker Optical can operate on a much looser budget, allowing it to focus on obtaining more market share. The quality of products from Whitaker Optical will be superior to competitors because of its commitment to Essilor lenses and its use of state-of-the-art equipment within the lab.

The use of a website for convenient selection, order, and payment is another competitive edge over competitors in the optical industry. Other companies merely act as middlemen and negotiate through independent optometrists. Customers are able to choose the most superior products via the website and are given the prices for each item up front.

Customers view this as a very customized experience in which they are in control of purchasing exactly what they want.

What are some opportunities for Whitaker Optical? Whitaker Optical must capture the market of people who are looking for the best deal on eyewear. Their primary concerns are price, quality, and convenience. Whitaker Optical also has the opportunity to obtain a share of the younger sunglass market. By offering the exact styles and brands as other retailers, Whitaker Optical can offer the same products for less while still garnering a profit. Whitaker Optical also is the first to offer prescription eyewear online, therefore making it the first business of its kind.

What are some weaknesses? Whitaker Optical's main weakness is a lack of initial capital to fund the lab. There are several ways to obtain capital, such as take on partners or take out loans, but for the sake of academic research, this weakness has been omitted. Whitaker Optical's other weakness is its lack of initial market share. To obtain the revenues and production capacities mentioned in this discourse, many labs require years and even decades. However, because of the internet and the system that Whitaker Optical uses to advertise, demand for the company's products could increase much more quickly.

What are some competitor's strengths and weaknesses? Wal-Mart and Lens Crafters have two main strengths in their convenience and their competitive pricing.

Both obtain a great deal of volume because of their locations in malls and in community centers. They also already retain a large share of the retail optical market. However, their market is different in that the customer would prefer to deal only with his doctor, and Whitaker Optical, and has little time to physically go to these locations. These stores often give customers a feeling of mass production rather than individual customization. Another of Wal-Mart's weaknesses is that it still considers itself a discount department store. Often times it purchase inferior quality products from wholesalers to use in their eyewear. Eventually coatings used by Wal-Mart's labs wear off or are difficult to clean because of a lack of investment into new technology. Wal-Mart fails to focus on quality, and is more interesting in rounding out its image of "one-stop shopping".

Why hasn't anyone else done this? Pearle Vision and Lens Crafters don't do this because of two reasons: One is that this type of retail prohibits them from using their top marketing tool, the one hour glasses promise. The other reason is that their distribution centers and outlets are already set up to do in-store retail, meaning that their labs are in the retail outlets. That would create serious problems for distribution. Wal-Mart doesn't do this because of the simple fact that Wal-Mart's main purpose is to bring customers into the store. By doing this, Wal-Mart feels it encourages impulse buying, which is virtually impossible to recreate online. Wal-Mart may also feel that not enough people would be willing to purchase eyewear this way to make the endeavor profitable or cost effective for them.

LIST OF REFERENCES

1. American Demographics, September, 2001
2. Dana-Nicolet Lascu, International Marketing Managing Worldwide Operations in a Changing International Environment, Cincinnati: Atomic Dog Publishing, 2003, 169.
3. Warren, Accounting 19th ed. Cincinnati: South-Western College Publishing, 1999 p.672.
4. http://www.sola.com/consumers/lens_materials.shtml
5. Karen Lissakers, Wall Street Journal, 11/19/92.
<http://home.alltel.net/bsundquist1/gcib.html#TB3>
6. <http://www.local2209.org/nafta/>
7. Griffin, Pustay. International Business a Managerial Perspective 3rd Prentice Hall, 2003.
8. <http://www.moneyglossary.com/?w=Just-in-time+inventory+systems>
9. http://www.opticalonline.com/labfeat_jit.shtml
10. <http://www.gerbercoburn.com/products>
11. <http://www.satis-vacuum.ch/site/productsset.html>
12. <http://hyperphysics.phy-astr.gsu.edu/hbase/phyopt/antiref.html>
13. <http://science.howstuffworks.com/question615.htm>
14. <http://www.allaboutvision.com/lenses/coatings.htm>
15. Vision Watch, Jobson Optical Research, 2003, CD format.
16. <http://www.fda.gov/cdrh/LASIK/default.htm>
17. http://www.noglasses.com/vision_correction_cost.html
18. Michael Marn, Robert Rosiello, "Managing Price, Gaining Profit". Harvard Business Review No. 92507

1. American Demographics, September, 2001
2. Dana-Nicolet Lascu, International Marketing Managing Worldwide Operations in a Changing International Environment, Cincinnati: Atomic Dog Publishing, 2003, 169.
3. Warren, Accounting 19th ed. Cincinnati: South-Western College Publishing, 1999 p.672.
4. http://www.sola.com/consumers/lens_materials.shtml
5. Karen Lissakers, Wall Street Journal, 11/19/92.
<http://home.alltel.net/bsundquist1/gcib.html#TB3>
6. <http://www.local2209.org/nafta/>
7. Griffin, Pustay. International Business a Managerial Perspective 3rd Prentice Hall, 2003.
8. <http://www.moneyglossary.com/?w=Just-in-time+inventory+systems>
9. http://www.opticalonline.com/labfeat_jit.shtml
10. <http://www.gerbercoburn.com/products>
11. <http://www.satis-vacuum.ch/site/productsset.html>
12. <http://hyperphysics.phy-astr.gsu.edu/hbase/phyopt/antiref.html>
13. <http://science.howstuffworks.com/question615.htm>
14. <http://www.allaboutvision.com/lenses/coatings.htm>
15. Vision Watch, Jobson Optical Research, 2005, CD format.
16. <http://www.fda.gov/cdrh/LASIK/default.htm>
17. http://www.noglasses.com/vision_correction_cost.html
18. Michael Marn, Robert Rosiello, "Managing Price, Gaining Profit". Harvard Business Review No. 92507